

535/2
PHYSICS
Paper 2
Oct. / Nov.2004
2¼ hours

UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Certificate of Education

PHYSICS

Paper 2

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

Attempt any **five** questions.

Mathematical tables slide rules and silent non-programmable calculators may be used.

These values of physical quantities may be useful to you.

<i>Acceleration due to gravity</i>	=	10 m s^{-2}
<i>Specific heat capacity of water</i>	=	$4200 \text{ J kg}^{-1} \text{ K}^{-1}$
<i>Specific heat capacity of copper</i>	=	$400 \text{ J kg}^{-1} \text{ K}^{-1}$
<i>Specific latent heat of fusion of water</i>	=	340000 J kg^{-1}
<i>Speed of sound in air</i>	=	320 m s^{-1}

1. (a) Describe an experiment to estimate the thickness of an oil molecule.
(07 marks)
- (b) Explain the following observations:
 - (i) When mercury and water are separately poured on glass, mercury does not wet glass but water does. (03 marks).
 - (ii) when a detergent is added to a clean water surface, a needle floating on it (water surface)sinks. (02 marks)
- (c) A small steel ball is allowed to fall centrally down a tall cylinder containing lubricating oil.
 - (i) Sketch the velocity-time graph for the motion of the ball. (01 mark)
 - (ii) Describe the features of the graph. (03 marks)
2. (a) Define the term **velocity ratio** as applied to machines.(01 mark)
- (b) The graph in figure 1 shows how load varies with effort in an experiment using a single string pulley system of velocity ratio 5.

For a load of 450 N, find the

- (i) effort. (01 mark)
 - (ii) mechanical advantage. (03 marks)
 - (iii) efficiency. (01 mark)
- (c) A block and tackle pulley system has two pulleys in the lower block and three in the upper block. Sketch
- (i) the diagram of this pulley system. (02 marks)
 - (ii) a graph showing the variation of mechanical advantage with load. (02 marks)
 - (iii) Explain why the efficiency of such a pulley system is Less than 100% (02 marks)
- (d) Name any two uses of the type of pulley drawn in (c) (i).
(02 marks)

A graph showing variation of load with effort.
(graph missing)

3. (a) Define **specific latent heat of vaporization**. (01 mark)
- (b) A calorimeter of mass 35.0 g and specific heat capacity $840 \text{ J kg}^{-1} \text{ K}^{-1}$ Contains 143.0g of water 7°C . Dry steam at 100°C is bubbled through the water in the calorimeter until the temperature of the water rises to 29°C . If the mass of steam which condenses is 5.6 g,
- (i) calculate the heat gained by water and calorimeter. (04 marks)
- (ii) obtain an expression for the heat lost by the steam in condensing at 100°C and in cooling to 29°C . (03 marks)
- (iii) find the specific latent heat of vaporisation of water. (03 marks)
- (c) Explain, in terms of molecules, what is meant by a saturated vapour. (02 marks)
- (d) Describe briefly **one** application of evaporation. (03 marks)
4. (a) (i) what is a magnetic field? (01 mark)
- (ii) state the law of magnetism (01 mark)
- (b) (i) Explain with the aid of diagrams, how a steel bar can be magnetised by the single touch method. (04 marks)
- (ii) Sketch the magnetic field pattern around two bar magnets Whose north poles face each other. (02 marks)
- (c) with the aid of a labelled diagram, describe how a simple a.c. generator works. (08 marks)
5. (a) What is meant by a **conductor** and **an insulator**? Give an example of each. (03 marks)
- (b) (i) Explain briefly how you can charge a conductor negatively by induction. (05 marks)
- (ii) Describe how it can be confirmed that the conductor in (b) (i) is negatively charged. (02 marks)
- (c) Explain the action of a lightning conductor. (06 marks)

Turn over

6. (a) Explain **dispersion** as applied to light. (02 marks)
- (b) (i) what is a **pure spectrum**? (01 mark)
- (ii) With aid of a labelled diagram, describe briefly how a pure spectrum is produced. (06 marks)
- (c) (i) Distinguish between a primary and a secondary colour (02 marks)
- (ii) Figure 2 shows colours mixed by addition. Name the colours represented by the parts labelled A, B, C and D. (04 marks)

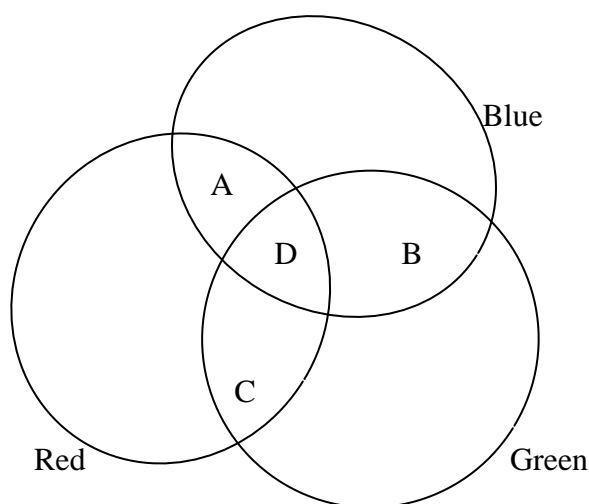


Fig.2

- (d) State the colour of a yellow dress in green light. (01 mark).

Turn over

7. (a) (i) Define an **echo**. (01 mark)
- (ii) State the conditions required for a stationary wave to be formed (02 marks)
- (b) List the factors on which the frequency of a wave in a vibrating string depends. (03 marks)
- (c) Describe an experiment to demonstrate **resonance** in a closed pipe (05 marks)
- (d) A child stands between two cliffs and makes a loud sound. If it hears the first echo after 1.5 s and the second echo after 2.0 s, find the distance between the two cliffs.
- [Speed of sound in air = 320 ms^{-1}] (05 marks)

Turn over

8. (a) (i) what is meant by **cathode rays**? (01 mark)
- (ii) With the aid of a labelled diagram, describe how cathode rays are produced by thermionic effect. (05 marks)
- (b) With reference to the cathode ray oscilloscope, describe:
- (i) the function of the time-base. (02 marks)
- (ii) how the brightness is regulated. (02 marks)
- (c) A cathode ray oscilloscope (C.R.O) with time –base switched on connected across a power supply the wave form shown in figure 3 is obtained.

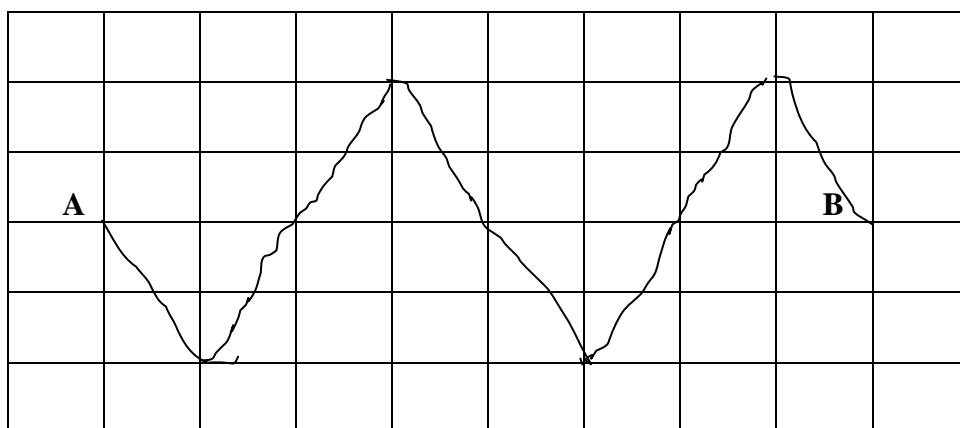


Fig .3

Distance between each line is 1 cm.

- (i) Identify the type of voltage generated by the power supply. (01 mark)
- (ii) Find the amplitude of the voltage generated if the voltage gain is 5 V cm^{-1} . (02 marks)
- (iii) Calculate the frequency of the power source if the time-base setting on the C.R.O is $5.0 \times 10^{-3} \text{ s cm}^{-1}$. (03 marks)

END